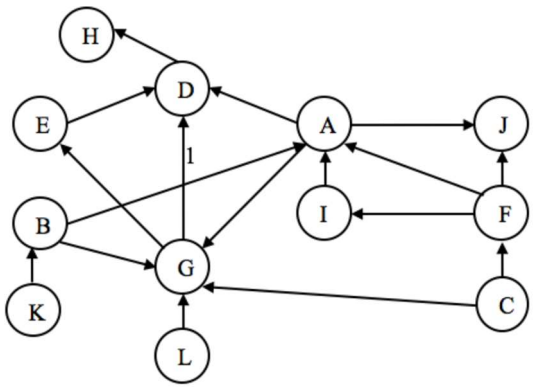
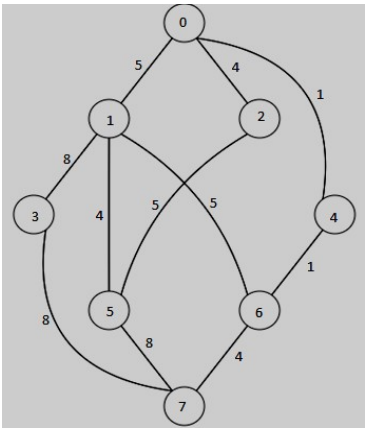
Shiv Nadar University Chennai

End Semester Examinations, 2022-2023 Odd

Question Paper

Name of the Programme: **B.Tech. CSE (IoT)**		Semester: **III**
Course Code & Name: **CS1006T DATA STRUCTURES**		
Regulation 2021		
Time: **3 Hours**		Maximum: **100 Marks**

Q.No		Short Answer Type Questions	Marks	CO#	KL#
1	a	There is a lake and there are a sequence of *n* lotus leaves using which a frog plans to cross the lake. Imagine that the numbers *1* to *n* are written on the leaves which are spread across the lake from the frog's side of the lake to the other side. The frog is initially in leaf numbered 1. In each jump, the frog will skip *(m-1)* leaves and land on the m^{th} subsequent leaf where *m* is the number written on the current leaf that the frog is in. To get to the leaf numbered *n*, how many times does the frog need to jump? Explain your answer with regard to how the above scenario can be applied to time complexity analysis.	5	CO1	KL5
2	a	Evaluate the following postfix expressions using stack data structure. i) `1 2 + 4 2 / 7 3 * + - 2 3 * +` ii) `3 2 3 1 + * 2 4 + 2 1 * - / *`	5	CO2	KL4
3	a	Construct the binary tree given its inorder and postorder traversals. Inorder traversal: `bedcafgh` Postorder traversal: `ecdbghfa`	5	CO3	KL4
4	a	Construct a `min-heap` from the following list of elements: 4,5,10,2,3,8,9,1,6 Do 3 `delete_min()` operations from the heap and show the heap after each deletion.	5	CO3	KL3
5	a	Find a valid topological ordering for the graph given in Fig. 1.  Fig. 1 Write down the intermediate steps used to arrive at a topological ordering.	5	CO3	KL3

6	a	Write a valid DFS (Depth First Search) and a valid BFS (Breadth First Search) traversal order for the graph given in Fig. 1. Use C as the starting vertex.	5	CO3	KL2
7	a	Derive the recurrence relation of merge sort and solve it to derive the time complexity of merge sort using telescoping method.	5	CO4	KL4
8	a	Compare linear probing and quadratic probing methods of collision resolution in hashing. Does quadratic probing method solve the primary clustering problem encountered with linear probing?	5	CO5	KL5
Q. No		Long Answer Type Questions	Marks	CO#	KL#
9	a	Write a C program to add two polynomials represented using singly linked lists. Comment your code.	15	CO2	KL2
10	a	 Fig.2 Find the minimum spanning tree for the graph in Fig.2 using Prim's algorithm. Show the detailed steps.	10	CO3	KL3
	b	Write the adjacency matrix for the graph given in Fig.2.	5	CO3	KL2
11	a	Sort the numbers 12, 16, 3, 24, 5, 18, 20 using i) Insertion sort (4 marks) ii) Heap sort (6 marks) iii) Quick sort (5 marks) You must show the order of the elements in each pass for each algorithm. Use median-of-three method to choose pivot element in quick sort.	15	CO4	KL3
12	a	Insert the following numbers using multiplication method into a hash table of size 100: 2384, 1276, 3421, 1843, 2853, 1467, 1653, 2753 Assume constant A=0.6180339887	7	CO5	KL2
	b	Insert the following elements into a hash table of size 23: 72, 97, 79, 98, 118, 102, 121, 125, 120, 51, 96, 75 Use double hashing to resolve collisions (Assume $h_1(k) = k \bmod 23$ and $h_2(k) = k \bmod 19$)	8	CO5	KL3

KL – Bloom's Taxonomy Levels
(KL1: Remembering, KL2: Understanding, KL3: Applying, KL4: Analyzing, KL5: Evaluating, KL6: Creating)
CO – Course Outcomes
